

12/13/2007 Response to Office Action
U.S.S.N. 10/807,944

Page 7

REMARKS

The present invention relates to an improved chemical-mechanical polishing (CMP) slurry composition. Claims 1-16 are currently pending.

Claims 1-16 are rejected under U.S.C. 35 103(a) as allegedly being unpatentable over Small *et al.* (US 2003/0162398) in view of Bringham *et al.* (6,812,193) and Sethuraman *et al.* (US 5,972,124), evidenced by Marinescu *et al.* (Handbook of Ceramic Grinding and Polishing). The Office Action states that Small *et al.* teaches an aqueous composition for CMP and a broad selection of abrasives including alumina, fumed alumina, and titania. The Office Action further states that Marinescu *et al.* provides typical types of particles used for grinding and polishing. The Office Action points out that Small *et al.* fails to teach the specific quantity of metal ions as defined in applicant's claims 1, 2, 3, and 10. The Office Action relies upon Bringham *et al.* to teach a slurry for polishing metal such as tantalum, including about .001 to 5 grams/liter of metal ions such as those presented as salts of calcium, chloride ion. The Office Action asserts that, absent unexpected results, it would have been obvious to one of ordinary skill in the art at the time of the invention to include any amount of metal ions in the slurry of Small because Bringham teaches that such quantities of metal ions will enhance mechanical removal.

The Office Action also notes that Small fails to teach the type of alpha particles being alpha alumina. The Office Action relies upon Sethuraman *et al.* to teach that it is conventional to use alpha alumina particles in a CMP slurry. The Office Action states that it would have been obvious to select alpha alumina particles as the type of alumina to combine with the Small slurry because the Sethuraman reference illustrates that alpha alumina is effective for CMP polishing compositions. The Office Action asserts that it would have been obvious to one skilled in the art at the time of invention to select alpha alumina particles because Sethuraman illustrates that alpha alumina is effective for CMP polishing compositions.

Applicants respectfully disagree. Applicants have amended claims 1 and 10 with the limitations of original claims 6 and 13. As a result claims 6 and 13 are canceled and claims 7 and 14 are amended to reflect the change in dependency. No new matter enters as a result of this amendment. The amended claims more particularly point out that the abrasive is part of the composition in a defined amount.

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12/13/2007 Response to Office Action
U.S.S.N. 10/807,944

Page 8

For subject matter defined by a claim to be considered obvious, the Office must demonstrate that the differences between the claimed subject matter and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a); see also *Graham v. John Deere Co.*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966). The ultimate determination of whether an invention is or is not obvious is based on certain factual inquiries including: (1) the scope and content of the prior art, (2) the level of ordinary skill in the prior art, (3) the differences between the claimed invention and the prior art, and (4) objective evidence of nonobviousness. *Graham*, 383 U.S. at 17-18, 148 U.S.P.Q. at 467.

1. *Scope and Content of the Prior Art*

Small *et al.* teaches a CMP composition comprising an abrasive at least partially coated with a catalyst. The Small reference theorizes that the **catalyst-coated abrasive** and the oxidizing agent react at the catalyst surface to generate free radicals that are effective intermediates in the reaction between the oxidizing agent and the substrate (emphasis added). The Small reference teaches that the catalyst, coated on the abrasive, is a metal other than a metal from groups 4(b), 5(b), or 6(b) of the Periodic Table.

Bringham *et al.* teach a slurry comprising a chloride ion and a sulfate ion. The preferred counter ion to these anions is sodium (column 4, lines 42-43). In fact, the Bringham reference demonstrates the dramatic effect of adding NaCl to a Cu polishing slurry in Table 1. They do not mention any effect of calcium in their polishing composition.

Sethuraman *et al.* teach a cleaning process for substrates that have been polished with a fixed abrasive pad comprising, *inter alia*, an alpha alumina abrasive. The cleaning composition taught by Sethuraman *et al.* includes either an acid and peroxide, or an acid oxidant. Sethuraman *et al.* do not teach that alpha alumina is effective in CMP compositions, they merely list alpha alumina one of the many particulates that can be part of a fixed abrasive pad, which will contaminate a substrate surface. Hence, the need for a cleaning process to remove the embedded particulates. This reference makes no mention of qualitative results of the different abrasives. Additionally, the Sethuraman *et al.* reference does not teach that the abrasives on a fixed pad are liberated into the polishing composition. The

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12/13/2007 Response to Office Action
U.S.S.N. 10/807,944

Page 9

Sethuraman reference teaches that the abrasives become dislodged from the pad and adhere to the surface of the substrate (column 4, lines 13-20). The substrate is pressed faced down on the pad (column 3, lines 60-64). Therefore, the implication is that the particles are transferred from the pad directly to the substrate. Sethuraman *et al.* does not teach nor imply that the particles become liberated into the polishing composition.

2. *Level of Ordinary Skill in the Art*

For the purposes of the present argument, one of ordinary skill in the art can be treated as someone with an advanced chemistry degree and at least a few years of experience in the field of chemical-mechanical polishing of substrates.

3. *Differences Between Claimed Invention and Prior Art*

In order to arrive at the present invention as defined by the pending claims, one of ordinary skill in the art, at the time of invention, would have had to ignore the teachings of Small *et al.* that the metal is coated on the abrasive particle, and is not in the form of an ion in the composition, as in the subject claims. Furthermore, the person of ordinary skill in the art would have had to ignore the teaching of Bringham *et al.* that the active species is chloride or sulfate, and that the preferred form to supply the chloride or sulfate is sodium (column 4, lines 37-41). Furthermore, the person of ordinary skill in the art have had to misinterpret the teachings of Sethuraman *et al.* to have come away with the idea that alpha alumina is effective as an abrasive in a CMP composition. In fact, Sethuraman *et al.* discuss the advantages of a fixed abrasive pad over a composition containing suspended abrasives in the Background section (column 2, lines 19-28).

4. *Objective Evidence of Unobviousness*

For purposes of the present argument, applicants have no need to refer to any objective evidence of unobviousness of the present invention as defined by the pending claims.

5. *Consideration of Graham Factors Together*

Given that the modifications of the prior art necessary to arrive at the claimed subject matter would have had to necessarily involve the teachings found only in the applicants' specification, applicants respectfully submit that a person of ordinary skill in the art would

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12/13/2007 Response to Office Action
U.S.S.N. 10/807,944

Page 10

not have found the claimed invention obvious. In view of the foregoing comments concerning each of the Graham factors, applicants respectfully submit that the subject matter defined by the pending claims is unobvious over the combination of Small *et al.* in view of Bringham *et al.* and Sethuraman *et al.*, evidenced by Marinescu *et al.*, and that the obviousness rejection should be withdrawn.

Conclusion

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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